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Application of rock mass classification and blastability index for the improvement of wall control at Phoenix Mine

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ABSTRACT

The study sought to establish the applicability of rock mass classification as a primary input to wall control blasting. Conventional rules of thumb are used to develop blast designs based on parametric ratios with insufficient consideration of the rock mass factors that influence the achievability of final wall designs. Control of the western highwall of the Phoenix pit had proven to be challenging in that the designed catchment berms and wall competence were perpetually unachievable from the pit crest to the current mining levels. This exposed the mining operation to safety hazards such as local wall rock failure from damaged crests, frozen toes and rolling rock falls from higher mining levels. There was also an effect of increased standoff distances from the concerned highwall which reduce the available manoeuvring area on the pit floor and subsequently the factor of extraction that is safely achievable. The study investigated the application of rock mass classification and the Blastability Index (BI) as a means to improve wall control. This was achieved by establishing zones according to rock type forming the western highwall rock mass wherein distinguishing rock mass classification factors were used to establish the suitable wall control designs through a Design Input Tool (DIT). The DIT consolidated rock mass classification methodologies such as the Geological Strength Index (GSI) and the Rock Mass Rating (RMR) and related them to the BI and discontinuities of the rock mass to produce a tool that can be used to develop objective wall control designs. The designs driven by the tool inherently take into account the rock mass characteristic factors at the centre of rock mass classification methods and significantly reduce the dependence on rule of thumb. It was found that this approach yields designs with powder factors that are consistent with the rock breaking effort and the behaviour of discontinuities while remaining biased towards preservation of perimeter wall rock.